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THE GENERAL BOARD

United States Forces, European Theater

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MILITARY RAILWAY SERVICE

MISSION: Prepare report and Recommendations Regarding the
Organization and Mission of Military Railway Service
Including General Headquarters and Responsibility
for Operations and Maintenance of Military Railroads.

The General Board was established by General Orders 128, Headquarters, European Theater of Operations, United States Army dated 17 June 1945, as amended by General Orders 182, dated 7 August 1945, and General Orders 312 dated 20 November 1945, Headquarters, United States Forces, European Theater, to prepare a factual analysis of the strategy, tactics, and administration employed by the United States Forces in the European Theater.

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THE GENERAL BOARD
UNITED STATES FORCES, EUROPEAN THEATER
APO 408

MILITARY RAILWAY SERVICE

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CHAPTER I

THE MISSION AND ORGANIZATION OF THE MILITARY RAILWAY SERVICE

SECTION I

MISSION AND ORGANIZATION

1. The Mission of the Military Railway Service was to provide prompt and dependable transportation by rail of troops and supplies.

2. Transfer of Responsibility from Corps of Engineers to Transportation Corps.¹

a. Prior to the issue of War Department Order 60, as amended by Section II, Order 66, series of 1942, the operation of military railways was a function of the Corps of Engineers. An organized reserve had existed, consisting of operating personnel recruited from various Class I civilian railroads in the United States. Generally, each of these major railway systems was responsible for the organization of one reserve railway operating battalion. These organizations, however, contained only commissioned personnel.

b. At the beginning of hostilities in December, 1941, one railway operating battalion was in training. Additional battalions were organized shortly thereafter, consisting of officer personnel drawn from the Reserve Corps, and enlisted personnel transferred from other units and obtained through the Selective Service system. It was from the latter that most of the men with civilian railway experience were obtained. About 40 per cent of the enlisted personnel of the Military Railway Service had from six months to 10 years of civilian railroad experience. Of this number, about 50 per cent had over four years experience. On 16 November 1942, shortly after the arrival of the first military railway units in the United Kingdom, all personnel assigned to the Railway Transportation Service of the Corps of Engineers was transferred to the Transportation Corps, Services of Supply, European Theater of Operations.

3. Organization of the Military Railway Service.

a. The units of the Military Railway Service in the European Theater of Operations were organized in accordance with approved Tables of Organization and Equipment. Its organization included a Headquarters, Military Railway Service, and various units which were organized generally in accordance with civilian railroad practice.

b. The basic operating unit was the railway operating battalion consisting of four companies. Headquarters company had charge of administration, train dispatching, supply, communications, and signals. Company "A" was responsible for maintenance of way and structures. Company "B" operated the engine house and made running repairs to motive power and rolling stock. Company "C", with 50 train and engine crews, was the actual operating unit. The duties of the commanding officer of a railroad operating battalion corresponded in scope and authority to those of a division superintendent of a civilian railroad. The personnel of the battalion consisted of 29 officers and 790 enlisted men. This basic operating unit was capable of operating 90 to 150 miles of track with not more than one terminal with classification yard facilities.

c. The railway shop battalion was for the purpose of maintaining and repairing rolling stock, and was equipped to serve from

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three to four railway operating battalions. The duties of the commanding officer of a railway shop battalion corresponded in scope and authority to those of a division master mechanic of a civilian railroad. In practice, the shop battalions were located in shops that had previously been used by civilian railway organizations. These battalions were, however, provided with sufficient mobile shop equipment to permit their operation in the field, even if shop facilities were not found in a suitable state of repair.

d. For the administrative control of the operating and shop battalion, a headquarters organization was provided, called the Railway Grand Division. It consisted of a headquarters and a headquarters company, and exercised control over from two to six railway operating battalions and one or two shop battalions. It included station masters for the administration of major terminal facilities. The duties of the commanding officer of a headquarters and headquarters company, Railway Grand Division, corresponded in scope and authority to those of the general superintendent of a civilian railroad. The Railway Grand Divisions were assigned so that each served one of the Sections of the Communications Zone.

e. The next higher organization was known as a Military Railway Service. Under the terms of Field Manual 100-10, "Administration", it was under the command of a General Manager, who had duties corresponding in scope and authority to those of the official of the same title in the organization of a civilian railroad. Two Military Railway Services were organized. The 1 Military Railway Service was organized for service in the North African Theater of Operations. It was in charge of railway operations in North Africa and other Mediterranean areas, including Southern France. Its operations before its participation in the invasion of Southern France are beyond the scope of this report. The 2 Military Railway Service was active in the United Kingdom during the planning and mounting period, and was designated to operate railways in support of the operation "Overlord" and subsequent operations.

4. Organization for Southern France, Operation "Dragoon."¹ For operation "Dragoon" and subsequent operations, the characteristics of the organization of the 1 Military Railway Service were as follows:

a. The Director General of the 1 Military Railway Service was directly responsible to the Commanding General, Southern Line of Communication, in all matters affecting the operation and control of railways.

b. The Military Railway Service was a command, and as such, troops of the other Arms and Services, including units for transit security, were assigned or attached for the accomplishment of the mission of the command.

c. The Director General, 1 Military Railway Service, was responsible for railway construction and rehabilitation as accomplished by attached or assigned Engineer units.

d. The 1 Military Railway Service was responsible for the procurement, storage, and issue of railway supplies and equipment, including track and construction material normally supplied by the Corps of Engineers. Requisitions were processed by Supply Division, Transportation Corps, and all the necessary administrative work was performed by that branch. Operation of depots was the responsibility of the Military Railway Service.

5. Comments on Railway Organization in Southern France.²

a. The Military Railway Service in the Southern Line of Communication was solely under the command of the General Manager, 1 Military Railway Service, who reported directly to the Commanding General of Southern Line of Communications. The Transportation Corps was responsible for movement programs only, and the Transportation Officer for Southern Line of Communications exercised control only over requests placed on the Military Railway Service, to insure that the capacity of the Military Railway Service was not exceeded. In effect, this made the Military Railway Service responsible for all railroad movement after the tonnage bids were allocated. This meant that the Military Railway Service had to provide, from within its own organization, a traffic or movement control system, the equivalent of that furnished by Movements Division of the Office, Chief of Transportation.

b. The priority of movement meetings held three times monthly served only as a medium for translating railway capacity into a tonnage movement program. This activity, originally under the control of the Services of Supply, Mediterranean Theater of Operations was subsequently transferred to Headquarters, Southern Line of Communications. Requests for cars were made directly by the Services to the Military Railway Service. Failure to call cars forward caused car shortages at some points and resulted in back-logs at other points. The Armies in Southern France retained cars for "rolling reserves" as in the North.

c. While it is true that the relatively independent status of the Military Railway Service in Southern France was an operational advantage, in that it permitted the exercise of command functions by the General Manager, there appears, however, to have been no gain in over-all performance during the period in which the Military Railway Service exercised its own movement control.

6. Organization for Northern France, Operation "Overlord".¹

a. For operation "Overlord" and subsequent operations, the characteristics of the organization of the 2 Military Railway Service were as follows:

- (1) The Chief of Transportation was a Special Staff Officer of the staff of the Commanding General, Communications Zone. The General Manager of the 2 Military Railway Service was responsible to the Chief of Transportation for matters concerning technical operation of the railways. All Military Railway Service units came under the jurisdiction of the commanders of the Sections of the Communications Zone in which the various units were operating.
- (2) Headquarters, 2 Military Railway Service, formed the railway staff section of the Office, Chief of Transportation, and exercised technical supervision over units of the 2 Military Railway Service.
- (3) The Corps of Engineers was responsible for railway construction and reconstruction. The 2 Military Railway Service was responsible only for routine maintenance-of-way operations.

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- (4) The Supply Division, Office, Chief of Transportation, had supply responsibility for items peculiar to Transportation Corps units, and processed requisitions on other services for materials supplied by them. The Corps of Engineers was responsible for procurement of all railway construction supplies, and their storage and issue.

b. In assigning Railway Grand Divisions an effort was made to locate them so that their jurisdiction included all of the area served by a single section of the Communication Zone. This plan was followed generally in Northern France. No fixed allocation of troops to a grand division was made, but the area served by each determined the number of operating units assigned to it for control. It was found generally advisable to assign three railway operating battalions, one railway shop battalion, and one base depot company to each grand division. With these troops, a grand division was normally capable of operating from 250 to 450 miles of railroad under Phase I conditions, that is, all operations performed by military personnel.

c. The original plan was that the base depot company should be responsible for the storage and issue of all Transportation Corps equipment. At the time that the mission of the base depot company was established, the Transportations Corps did not include the Motor Transport Service or any other operational service except that it was supposed that an inland waterways system might be operated as a function of the Military Railway Service. With the increased activity in other forms of transportation, it became obvious that supply requirements would necessitate a broader use of the base depot companies. Consequently, they were removed from the Military Railway Service and placed under the newly activated Supply Division, Office of Chief of Transportation.

7. Consolidation of the Two Military Railway Services.¹ In late November, 1944, the two Military Railway Services came under the jurisdiction of the Chief of Transportation, Communications Zone, European Theater of Operations. This accompanied the activation of Southern Line of Communications, European Theater of Operations, which assumed the logistical functions formerly the responsibility of Headquarters, Mediterranean Theater of Operations, of which the 1 Military Railway Service was a part. With the junction between the Armies effected, and the assumption of over-all logistical support by Communications Zone, European Theater of Operations, United States Army, it became necessary to co-ordinate the activities of both military railway services. On 6 February 1945, by General Order 6, Headquarters, European Theater of Operations, activated a provisional General Headquarters, Military Railway Service, to control both the 1 and 2 Military Railway Service. This order placed all military railway activities on the Continent under the technical supervision of the Chief of Transportation, Communications Zone, and under the command of the Director General, Military Railway Service. Command functions, formerly vested in the commanding generals of Sections of the Communications Zone, were granted to the Director General, including authority over the promotion, demotion, assignment, and reclassification of the personnel of the Military Railway Service. The commanding generals of the Sections of the Communications Zone retained area responsibility, including courts-martial jurisdiction, financial transactions, hospitalization, supply of items of common usage, and certain phases of personnel accounting. On 3 April 1945, a revision of Standing Operating Procedure 32, issued by Headquarters, Communications Zone, granted exempt status to the Military Railway Service. It is to be observed that these changes did not place the Military Railway Service under the command of the Chief of Transportation, but they did make

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him responsible for movement control throughout the Communications Zone.

8. Organizations Existing in European Theater of Operations on VE-Day.¹ Military Railway units assigned to, and operating in, the European Theater on VE-Day were as follows:

- a. General Headquarters, Military Railway Service, with the Director General in command.
- b. Two headquarters and headquarters companies, Military Railway Service, as authorized under Table of Organization and Equipment 55-202.
- c. Eight headquarters and headquarters companies, Railway Grand Division, as authorized under Table of Organization and Equipment 55-202.
- d. Twenty-four railroad operating battalions organized under Table of Organization and Equipment 55-225.
- e. Seven railroad shop battalions organized under Table of Organization and Equipment 55-235.
- f. Eight Military Police battalions organized under Table of Organization and Equipment 19-55.
- g. Two base depots companies, organized under Table of Organization and Equipment 55-260.
- h. Fifteen various railway maintenance units organized under Table of Organization and Equipment 55-500.¹ These included special mobile maintenance teams, for both general operations and hospital train maintenance.

SECTION 2

PERSONNEL PROBLEMS

9. Inexperience of Personnel.

a. Railway unit commanders, adjutants, and personnel officers were generally commissioned directly from civilian life and few had previous military experience. It was necessary to make the maximum use of civilian background to offset the lack of military experiences. This was later to cause considerable trouble, especially in the cases where;

- (1) Troop command functions were exercised.
- (2) Military administrative experience was required.
- (3) Military necessity demanded action unprecedented in civilian practice, as for instance in personal safety measures.
- (4) Knowledge of military terminology and material was required.

b. Experience levels in operating personnel were generally not satisfactory. Lack of civilian experience in the actual mechanical operation of railway equipment was general and was undoubtedly responsible for a considerable number of road accidents during Phase I operations in Northern France. This was not so true of units in Southern France, where more experienced battalions were used. Most of the officers in the battalions had civilian railroad experience,

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but in some instances company grade officers had not held positions of technical or executive responsibility. The public trials of railway personnel accused of pilferage of supplies from trains, while the cause of much unfavorable publicity, served to illustrate the lack of adequate training of unit commanders for performance of military duties. The field grade officers were generally competent railroad men. The necessity for deploying these highly skilled technicians over the widest possible range existed in the Railway Service to the same degree as in the other operational services.

10. Shortage of Skilled Yard and Terminal Operators. ¹

a. In the knowledge that much of the success in rail operations on the Continent would depend on the rapidity with which military cargoes could be forwarded through classification yards, the Chief of Transportation, in an urgent radio communication to the War Department, requested the services of 50 experienced terminal supervisors, division engineers, and road superintendents. While the request was handled promptly and the civilian experts flown to the European Theater of Operations within a remarkably short time, the problem of familiarization of this personnel arose immediately. It was specified that these experts have military background, if possible. Many actually had had such experience with the organized reserve or in World War I. However, these men were handicapped by reason of lack of knowledge of the planning, and current logistical problems, and it was some time before their services could be of real value.

b. Poor documentation had contributed to the confusion in the yards, and many valuable car miles were being dissipated in switching from depot to depot. Those officers, although they had the skill necessary to clear yards quickly when the routing and destinations were definite, were handicapped in the existing conditions. A general lack of working knowledge of the French language required the employment of interpreters, some of whom were experienced railroad men. The use of bi-lingual documentation would have simplified the task of these experts.

11. Lack of Traffic Personnel in Railway Operating Battalions.

a. In the organization of a railway operating battalion, there was no provision for trained yardmen (yard masters and switchmen) to take care of the extensive switching operations at railheads and classification yards. The usual number of railheads under the jurisdiction of each operating battalion was four to six, although in the advance sectors there were instances of one battalion operating 25 or 30 railheads. This resulted in taking qualified train and engine men off the road, in order to keep railheads and yards operating, and brought about an acute shortage of such personnel. Due to this condition, the men worked excessively long hours without proper rest, over extended periods of time.

b. In Southern France military movements control personnel for station or yard operation was an integral part of the railway organization. This type of control was similar to civilian railway practice. The station masters provided from the grand divisions, civilian traffic personnel under Phase II operations, and, when it became necessary, personnel of the operating battalions performed the functions of Railway Transportation Office ("RTO") personnel. The plan for operations in Northern France provided for the retention of traffic personnel ("RTO's") on permanent status in each area, while operating units might be moved freely to new areas where they

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would find traffic personnel already familiar with local conditions. It was not always possible, however, to retain Rail Transportation Office personnel in fixed assignments, and many instances occurred where it was necessary for railway operating personnel to assist and in some instances, to train, newly arrived replacements for these movement control agencies. When these changes occurred frequently, it was required that battalion officers devote a considerable proportion of their time to orienting and assisting the "RTO's" to the detriment of their own duties. Experience indicated that two officers in each battalion were constantly engaged in this type of duty.

12. Lack of Security Personnel.¹

a. The organization of the Military Railway Service in Northern France did not provide for adequate protection of freight in transit. In Southern France, Military Police units were assigned to the Military Railway Service for this purpose. Almost from the beginning of operations on the Continent, the problem of protecting supplies in transit was of major magnitude, particularly in Northern France during the first five months of operation. Guards for trains and static installations were drawn from railway operating units, or from other troop units within the immediate area of the Section of the Communications Zone in which operations were in progress. There were frequent instances where guards, provided by other than organizations of the Military Railway Service, were withdrawn without notice. In the earlier stages of the campaign, train guards were placed on trains at the ports, and were often required to travel long distances with insufficient rest. They were often without rations when trains were set out on sidings short of the destination, due to blocked yard facilities, power failures, and other causes.

b. Normandy Base Section of Communications Zone reported the excessive pilferage of goods from trains. The situation became so serious that it was necessary to withdraw a battalion of the 104 Infantry Division to provide train guards.³ Lack of adequate Military Police units for railway security made this necessary. Similar conditions existed in the Channel Base Section, and Transportation Corps port troop units were used as train guards.³ Many train loads of supplies especially susceptible to pilferage, including Quartermaster Class I and III and post exchange supplies, were handled in Advance Section with no protection other than that afforded by train and engine crews. Train guards, called into service and released in the same manner as train and engine crews, would have solved this problem.

13. Liaison Officers.³ During operations in France, Belgium and Luxembourg, the importance of close liaison with the government-controlled railways and with civilian rail organizations was demonstrated. This was particularly applicable to Phase II and III operations, (Refer to paragraph 20 for definition of phase system) during which successful operation depended on the assistance and co-operation of civil rail authorities. The Military Railway Service was hindered in effecting the proper liaison by the lack of qualified commissioned personnel in grand divisions and operation battalions. One of the principal difficulties was the inability to speak the language of the country in which operations were in progress, making it necessary to rely upon interpreters. Also, the limited number of officers sufficiently experienced for such assignment was a contributing cause.

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CHAPTER 2

OPERATIONS OF THE MILITARY RAILWAY SERVICE

SECTION 1

OPERATIONS IN THE UNITED KINGDOM

14. Organization for Operations.

a. The operation of the Military Railway Service in the European Theater of Operations began with the arrival of the '61 Engineer Railway Transportation Company in the United Kingdom in September, 1942, prior to the transfer of railway activities to the Transportation Corps. Immediately following this transfer, a staff section was activated in the Office, Chief of Transportation, for co-ordination of railway activities.

b. The first tasks of the newly activated Military Railway Division of the Transportation Corps were the procurement and training of railway troops, and the design and procurement of railway equipment for use in the United Kingdom, and later on the Continent.

c. Prior to the movement of the Military Railway Service units overseas, it had been necessary to provide as much technical training as possible, due to the fact that the majority of the enlisted personnel had no previous experience on American railroads. The various battalions were assigned to civilian rail lines in the United States and received from two to four months' technical training. As the troops arrived in the United Kingdom, this technical training was continued. Through an arrangement with the British railroads, the men were assigned to switching service at various depots and also operated short distances on the main lines. The training program in the United Kingdom was designed to make certain that the men were good soldiers as well as railroad men.

15. Assembly of Railway Equipment.⁴

a. In order to conserve shipping space during the pre-invasion build-up, all rail cars were shipped to the United Kingdom knocked down. Civilian labor was used for assembly, supplemented and supervised by Military Railway Service personnel. By 30 June 1944, the program of assembling freight cars was substantially complete, as far as it was planned to carry it in the United Kingdom. By that date, about 40 per cent of the freight cars estimated to be required had arrived in the United Kingdom and about half of these had been erected. Requirements and comparative performance in erection are shown in Table I.

TABLE I
STATUS OF FREIGHT CAR PROGRAM

<u>Type Cars</u>	<u>Estimated</u>	<u>On Hand</u>	<u>Erected</u>		<u>Average</u>
	<u>Require-</u>	<u>30 June</u>	<u>Up to 29</u>	<u>Up to</u>	
	<u>ments</u>	<u>1944</u>	<u>February</u>	<u>30 June</u>	<u>rate of</u>
			<u>1944</u>	<u>1944</u>	<u>assembly</u>
					<u>per month</u>
20-ton box	25,000	9,280	1,661	4,489	707
20-ton gondola	12,600	5,020	164	2,681	629
40-ton gondola	5,700	2,891	2	456	114
40-ton tank	3,500	710	537	674	34

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50-ton flat	6,000	1,520	540	1,240	175
35-ton refrigerator	1,200	200	193	--	--
20-ton caboose	3,200	760	150	415	66

While the 35-ton refrigerator and 40-ton tank car receipts were not favorable, it was reasonably certain that the number of cars scheduled for outloading, upon the completion of sufficient rehabilitation at Cherbourg (FO 1522), would be adequate to support initial operations, even though captured or recovered equipment was not available in an appreciable quantity.

b. The status as to locomotives was equally favorable, in the number on hand. Approximately half those estimated to be required were available at the end of March, 1944, and by 30 June 1944, a total of 1,358 of type 2-8-0 and 362 of type 0-6-0 steam locomotives were available in the United Kingdom.

16. Assistance to British.⁴

a. The support of military operations in North Africa and the losses incident to the evacuation of the British Armies from France seriously depleted the stock of railway equipment in the United Kingdom. Labor shortages existed in the manufacturing plants and in the railway organizations. The constantly increasing burden, due to the arrival of the United States Forces and of supplies, severely overtaxed existing rail facilities and the situation became critical. In order to alleviate this condition, the Military Railway Service took over the task of operating switching engines and yard activities at two United States Army depots. Soon thereafter American units were augmented and additional depots were provided with troop labor for yard operations. By October, 1943, the responsibilities of the Military Railway Division, Office, Chief of Transportation, European Theater, included the operations of all United States Army depot switching. Main line operations, however, remained the responsibility of the British civilian railroads.

b. A critical situation existed in the supply of freight cars and locomotives. It had been estimated that 400 freight locomotives and 2000 freight cars would be required to augment British equipment for the use of the United States Forces in the United Kingdom. In order that the minimum of instructions would be required for their operation, a locomotive of American manufacture was selected with characteristics generally similar to those of the British Ministry of Supply "Austerity" type 2-8-0, and equipped with both Westinghouse and vacuum type air-brakes. All locomotives, including the type 0-6-0 switching engines, were procured under "Joint Stock Pile" agreements. While standardization permitted the use of equipment earmarked for the United States Army for non-tactical operations in the United Kingdom, "recall" provisions insured its availability on 14 days' notice for shipment to the Continent. By January, 1944, the freight car assembly program, initiated early in 1943, had reached a level which permitted the release of a substantial number of cars to the British railways. By the end of March, 1944, 700 of the 50-ton American type flat cars, urgently required for the movement of heavy equipment, had been released to the British railways. Also, 52 refrigerator cars for handling perishable products for the United States Forces and 200 tank cars were similarly provided. Two hundred more tank cars were scheduled for delivery at the rate of 50 units per week. All equipment was subject to the 14-day release agreement.

17. Assembly of Railway Troop Units.^{4,5}

a. Few military railway troop units arrived in the European

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Theater of Operations until late in 1943. Practically all of the trained units had moved into active Theaters of Operations. The 761 Transportation Company, two thirds of which had been sent to North Africa, was the only actual operating unit present in the United Kingdom early in 1943. About mid-July, 1943, the 729 Railway Operating Battalion arrived in the United Kingdom. In principle, all military personnel present in the European Theater of Operations having civilian railway experience were transferred to this unit, raising it to full strength.

b. By December, 1943, there were elements of three railway operating battalions and two shop battalions present in the United Kingdom. One of these shop battalions operated the freight car assembly plants, and the other the plant for the assembly and modification of types 2-8-0 and 0-6-0 steam, and 650 horse-power diesel, locomotives. Shop battalion personnel was also engaged in the conversion of Liberty ships to vehicle carriers and in the floating crane and barge program of the Marine Operations Division, Office, Chief of Transportation, which lacked experienced supervisory personnel with mechanical skill. At the end of March, 1944, Headquarters, 2 Military Railway Service, arrived in the United Kingdom. Both of the older railway operating battalions were withdrawn from the depot switching operations for additional military training, leaving the operational requirements of 25 depots to one battalion.

18. Plans for Operation "Overlord,"⁶

a. The planning for Continental operations of the 2 Military Railway Service was divided into two phases. The first phase, associated with the early operations of Advance Section, Communications Zone, contemplated but little operational activity other than reconnaissance, and the survey of existing railway plants uncovered by the assault. The second phase concerned the full scale use of railway facilities to support the Armies.

b. It was not expected that many miles of railroad would be in operation by D plus 41. Reconnaissance, repair, and the operation of work trains would constitute the major part of operations up to that date. Estimates of the degree of damage to rail facilities were as follows:

- (1) 50 per cent of the rails would require complete renewal.
- (2) 30 per cent of the rails would be salvageable for re-laying.
- (3) All bridges would require reconstruction.
- (4) Road beds would be partially destroyed, especially over culverts.
- (5) Watering and coaling facilities would be partially destroyed.

c. For the operations between D-Day and D plus 41, railway plans envisioned the following:

- (1) Movement of rolling stock to the Continent for unloading at Cherbourg (VO 1522) on or about D plus 25.
- (2) Reconstruction of rail facilities immediately

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south of Cherbourg (VO 1522), beginning about D plus 30, with extension of trackage south towards Brittany and east to Caen (VU 0567) as rapidly as the military situation would permit.

- (3) Reconstruction of 58.3 miles of track, including 161 bridge spans, totalling 5,906 feet.

d. Troop units scheduled for these operations and phased to arrive on the Continent by D plus 41 included: one Railway Grand Division, two railway shop battalions (one less one company), and two railway operating battalions. Five Engineer general service regiments and three dump-truck companies, phased to arrive on the Continent from D plus 8 to D plus 25, were scheduled in support.

e. In the planning for operations subsequent to D plus 41, it was expected that railway reconstruction would follow as closely as possible behind the advancing Armies. It was planned to have double track operation by D plus 120 from Cherbourg as far east as Droux (VR 3135), and south to the Brittany ports of Vannes (VH 1707) and Lorient (VG 7321). After D plus 120 the railway lines were to be pushed eastward to the German frontier as the Armies advanced.

SECTION 2

OPERATIONS IN NORTHERN FRANCE

19. Opening of Cherbourg.⁶

a. The advance detachment of 2 Military Railway Service landed on Utah Beach on 17 June 1944, (D plus 11), and immediately began reconnaissance of rail lines in the Carentan (VT 3984) - Isigny (VT 5085) area. Cherbourg had not fallen as planned and the advance of the United States Forces had been contained within a shallow lodgement area. Rail facilities were not damaged nearly to the extent estimated, and a considerable quantity of rolling stock was captured intact.

b. Reconnaissance parties moved over all rail lines within the lodgement area, but, until after 26 June 1944, could go no further north than Valognes (VO 2508). By 10 July 1944, Headquarters, 2 Military Railway Service, was established in Cherbourg. Repair of the rail facilities of that port began soon after its capture. Civilian labor was available, but there was a shortage of skilled workers. Within a few days, enough civilian laborers were found to assist the Engineer and Transportation Corps troops in clearing the yards and terminal facilities. Soon thereafter, it was possible to start railway operations to Lison (VT 5378), and further repair was expedited for the support of impending offensive operations south from St. Lo (VT 4963).

20. Plans for the Return of Railways to Civilian Operation.¹

During July, 1944, Supreme Headquarters, Allied Expeditionary Forces, made plans for the return of railway facilities to the liberated Allied governments. This was to be accomplished in successive stages, as the facilities were returned to operating conditions and the civilian organizations re-assembled. Operations were planned to pass through three stages as follows:

a. Phase I: operation exclusively by military personnel, assisted by civilians whenever possible.

b. Phase II: operation partially or completely by civilian railway organizations under direct military supervision.

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c. Phase III: operation completely by civilians with indirect military supervision effected through liaison officers.

21. St. Lo (VT 4963) to Paris (VS 0544).⁷ The speed of the advance of the Armies and the sudden change of direction of the main effort to the east after the break-through at St. Lo required drastic changes in plans for the development of rail transportation. The Falaise (VU 1436) pocket prevented the extension of the eastern routes as planned, but its reduction opened up additional rail facilities. By mid-August, 1944, the advance in the direction of Paris was ahead of schedule, and during the first 50 days after the break-through, that is, up to mid-September, 1944, the average rate of advance of the Armies was 10 miles per day. In an effort to keep pace with the Armies, rail construction was given the highest priority. By 15 August 1944, a single track line was in operation to Le Mans (VV 4161), and by 1 September 1944, to Paris. During this period, additional rolling stock was brought from the United Kingdom in Landing Ships Tank, converted by the addition of rails in their holds to supplement the carrying capacity of the limited number of Sea Trains available. The rapid progress in bringing rail facilities into operation in support of the Armies is revealed in the figures of performance in Table II.

TABLE II

PERFORMANCE OF MILITARY RAILWAYS, NORTHERN FRANCE, 1944

Month	July	August	September
Average tons hauled per day	1,520	3,410	11,834
Average number of trains per day	15.5	25.5	32.8
Average number of miles freight was hauled	22	26.2	267
Average tons of freight per train	138	133	351
Miles of track in use	60	--	4,788

22. Beginning of Phase II and III Operations in Northern France.¹

During October, 1944, arrangements were completed to return to the French the line extending from the Brittany Peninsula through Rennes (VY 0155) and Le Mans to Paris, first under Phase II operations, and as soon as practicable under Phase III. This permitted the resumption of movement of food supplies to the area of Paris. Liaison offices were established in Paris to co-ordinate French-Allied rail movement. It was during the early phases of this joint, and later, all-French operation that the failure to provide bi-lingual documentation caused difficulties. Diversion, apparent loss, and stagnation of cars in yards began to appear. It was clear that much had to be accomplished before efficient operation could be assured. The use of interpreters helped to a great extent, but the root of the trouble was in the marshalling yards and sidings, staffed with the French trainmen and car spotters.

23. Operations in the Last Quarter of 1944.⁷

a. The lack of more convenient port facilities to the north and west of Paris prevented the complete solution of the logistical problem. Antwerp (VJ 6795) was captured by the British on 6 September 1944, with the port facilities 95 per cent intact, but was denied for use as long as enemy resistance continued along the north side of the mouth of the Scheldt River. Rail deliveries from the Charbourg (VO 1522)

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area, even though supplemented by truck transport, were insufficient to support a continued offensive on a large scale. Certain critical shortages developed which brought the Armies to a halt near the German frontier. The relatively static conditions which prevailed favored the continuance of railroad reconstruction, and the capture of Le Havre (VL 4027) and Rouen (VR 2817) made it possible to shorten the rail lines to the combat zone.

b. During October, 1944, Normandy Base Section was able to move each day only 14,000 tons of supplies; Brittany Base Section moved 2,225 tons and Channel Base Section 1,915 tons, making a daily total of 18,140 tons exclusive of pipe-line deliveries. Shipments to the Armies and 9 Air Force averaged about 11,560 tons daily at that time. Of the total tonnage forwarded from rear areas, the railroads carried about 71 per cent.

c. During November, 1944, the requirements of the Armies and 9 Air Force remained fairly constant at about 11,000 tons daily. Shipments from the Cherbourg (VO 1522) area remained fairly constant at about 12,700 tons daily. The effect of the opening of Le Havre and Rouen became noticeable, being reflected in the increase of the shipments of Channel Base Section to a daily average of 7,585 tons. Rail shipments reached the daily average of 18,260 tons. The effect of the better condition of the railways east of Paris (VS 0544) also became noticeable. These lines had been maintained by the enemy for the transportation of material used in preparing frontier defenses. During the retreat, the enemy did not have enough time to cause extensive damage. Allied aerial bombardment had, of course, been concentrated in the area west of Paris.

d. During December, 1944, there was little change in rail shipments from the ports.

24. Problems in the Early Operations of the Railways in Northern France. The following are typical of the operational difficulties that arose during the early months of the campaign on the Continent:

a. Shortages in tools and equipment for maintenance were a serious handicap to operations during July and August, 1944. Units had departed from the United Kingdom in such haste that their equipment had to be left behind, to be forwarded later. The generally confused dump situation on the beaches hindered prompt receipt. This difficulty was partially overcome by the discovery of some tools in abandoned German installations and existing French shops, and the use of expedients.

b. Lack of knowledge of the characteristics of the road, such as grade, curves, road-bed conditions, and switching facilities were responsible for a considerable portion of operating troubles. This knowledge could only be obtained by experience.

c. Inexperience in locomotive crews, train crews, and the operators of other facilities was common. Increased demands upon the railways in the United States required the retention there of a large number of experienced railway personnel, and Selective Service provided only a fraction of the experienced railroad men needed.

d. In the Normandy Base Section, up to the end of November, 1944, the following main line accidents were reported. The number of those incidents that may be ascribed to operational errors should be noted.

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- (1) 29 derailments, due to: settling of track on filled in craters, switch points not closed, and unfamiliarity with French type manually operated switches.
- (2) 29 rear-end collisions, due to: inadequate protection by trainmen of train in block, and engineers not having control of train in occupied block.
- (3) Seven side-swipe collisions, due to: inexperience in train control in switching operations.

e. Until it was possible to echelon railway operating battalions in depth to permit point-to-point operation of train crews, there was considerable difficulty through over-extended operation by single crews. This was due to tactical operations and could not be avoided.

25. Shortage of Personnel. The expansion of the rail network west of Paris (VE 0544) caused the existing troop strength in the Military Railway Service to be extended to a degree not fully anticipated. Moreover, with the principal source of supply still located on the Cherbourg (VO 1522) peninsula, and the uncertainties of all-French operation, it was necessary to retain the northern lines into Paris under Phase I operation until early in 1945. Because of the shortage of military personnel for the operation of the railways, it was necessary to pass into Phase II and III operations earlier than had been intended. By the end of 1944, all French and Belgian railroads, with the exception of the line from Cherbourg to Paris and those lines extending eastward beyond Liege (VK 4727), Nancy (VU 8512), and Conflans (VU 8664), were being operated under Phase II and III.

SECTION 3

OPERATIONS IN SOUTHERN FRANCE.

26. Early Operations.

a. The initial landings of the combined United States and French Armies occurred on 15 August 1944. On 17 August 1944, the first rail operation started with the movement of a small quantity of supplies from the beach area near St. Tropez (BU 4917) over the narrow gauge line in that area to St. Maxim (VU 4922). By D + 5, three trains per day were moving cargo over this route.

b. The main railway routes were adjacent to and parallel to the Rhone River, and extended northward through Lyon (WX 9578) and Dijon (VO 0461). Another route, on the east bank of the Rhone River, extended north to Valence (VO 0295), thence through Grenoble (BJ 6526) to a junction with an east-west line at Dijon. Further extensions existed toward Nancy (VU 8512), Metz (VU 8657), Sarrebourg (WQ 5015), Strasbourg (WW 0990), and Mulhouse (WV 7002). Reconnaissance indicated extensive damage to bridges along the west bank of the Rhone River. Railroads on the east bank, however, were less damaged, and they were soon serving as the main supply route north. The line through Grenoble was useable, but the mountainous nature of the terrain in that direction indicated probable denial during the winter months because of snow conditions.

c. The first standard gauge railroad was opened from St. Raphael (BU 5833) to Aix-en-Provence (3F 5242). The line north to Grenoble was open except for two bridges—one across the Durance River at Meyrargues (VT 5854), and another across the Buoch River at Sisteron (BO 8817). A trucking operation was initiated to bridge these gaps so that the delivery of supplies to Grenoble would be uninterrupted. Later, temporary bridging was installed at both crossings to permit only car movement until more permanent structures could be provided to accommodate locomotives. Both bridges were open to traffic by 21 September 1944, with a daily movement capacity of 1500 tons each. By 25 September 1944, the line on the east bank of the Rhone River was open to Lyon (WX 9578), with a daily capacity of 3000 tons, and the line from Valence to Grenoble with an equal capacity.

27. Comparative Performance in Southern and Northern France.

a. In Southern France, the railway capacity was indicated by the bids for tonnage accepted and by the number of cars forwarded. The bids accepted increased from 4,973 tons on 26 September 1944, to 12,000 tons on 12 October 1944, and to 15,000 tons on 26 December 1944—the last date being D + 133 for the operations in Southern France. During the period 1 October–31 December 1944, the average freight car movement from the base depots to those of the Continental Advance Section was 664 units, and from there forward to the Armies, 557 units. Nine railway operating battalions were used in operations in Southern France, where Phase II conditions of operations prevailed generally throughout the campaign.²

b. In Northern France, for approximately the same calendar period, tonnage forwarded by the railroads increased from an average of 5,929 tons daily for the month of September, 1944, to 18,600 tons daily during the month of December, 1944 (31 December 1944 being D + 208). In the latter month, an average of 1,260 freight cars were forwarded daily from the rear areas to the Advance Section, and from there

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an average of 860 cars were forwarded daily to the armies. For these operations, 15 railway operating battalions were used mainly for the supervision of Phase II and Phase III operations, as well as the line from Cherbourg (VO 1522) to Paris (VS 0544), still under Phase I operation. 7

c. During the period October-December, 1944, a relatively static tactical situation existed in both areas, permitting increased reconstruction activity and the placing of the serviceable railway lines in better condition. Because of the larger network of track in Northern France requiring reconstruction, a somewhat longer time was required for its restoration. This accounts in part for the generally better performance at an earlier date in Southern France.

SECTION 4

FINAL PHASE OF OPERATIONS 1 JANUARY-8 MAY 1945

28. Plans for Resumption of Offensive. The resumption of the offensive to the Rhine River and beyond was planned during November and December, 1944. As they concerned railway activities, the plans centered upon the rapidity of reconstruction of railways to be uncovered by the advance. The establishment of railheads as far forward as possible was considered to be of primary importance. Trucking operations were to be organized to support fast moving columns (XYZ plan), until the necessary railroad bridges were constructed. Rail to truck transfer points were to be established at the forward railheads for further movement of supplies.

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29. Forward Displacement of Troop Units.

a. When it was evident that most military railway operations would take place in Belgium, Luxembourg, and Germany, plans were drawn for the forward movement of the operating battalions then manning a considerable portion of the railways in France. Because of the necessity for operating over a relatively wide network of railroads instead of over through lines as anticipated, the number of units available was not adequate to support other than Phase III operations in Western France. By the end of March, 1945, all of the railroads west of Paris were under Phase III operations, and the troop units were concentrated in a relatively narrow triangle with the apex resting on Paris, the northern leg in Western Belgium, and the other, almost directly east, resting on Luxembourg (VP 8413). It was found that Phase II operations were possible in both Belgium and Germany, which permitted wider dispersion of troop units.

b. The junction of the 6 Army Group and the 12 Army Group brought the rail lines in the Nancy (VU 8512)-Metz (VU 8657) region, vacated by the Third Army, under the control of the 1 Military Railway Service.

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30. Movement of Operating Battalions.

Prior to 31 January 1945, it was the policy of Military Railway Service to keep the older and more experienced operating battalions in advanced positions. This was accomplished by moving four to five battalions at the same time, instead of by "loop-frogging" which would have permitted the other battalions to remain in place, and in territory with which they were familiar. The result of this policy was that all battalions, instead of only one, operated in strange territory, where road, train, and engine men were not familiar with local operating

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conditions, facilities, and gradient characteristics. All these factors impeded the service and reduced the efficiency of units. In January, 1945, it was decided to change the practice to that of advancing only the rear battalion. It was found that this arrangement worked better. Experience showed that one battalion was as well qualified as another to perform in advanced sectors.

6

31. Difficulties at the Rhino Bridges.

a. Subsequent to the construction of the railway bridges over the Rhine River, difficulties arose in the immediate vicinity of the crossing at Mainz (WM 3657). This was due to the condition of the line between that point and Saarbrücken (WQ 4551). Inadequate signal communication facilities in the early stages caused delays in calling trains forward, with resulting congestion beyond Saarbrücken. A further cause for congestion was the difficulty encountered in expediting traffic beyond the bridge at Hanau (WM 8571). Until continuity of traffic was assured, cars were side-tracked in the Mainz area. Also, the Third Army was inclined to retain loaded cars as a rolling reserve. It was several weeks before the flow of empties began to equal the loaded cars moving over the bridge.

b. After destruction of the Romagen (WF 6519) bridge, it was planned to route all supplies for the First Army over the Mainz and Wesel (RA 2241) bridges which were constructed for the Third and Ninth Armies, respectively. To effect co-ordination, committees representing all interested agencies were formed to control traffic over each bridge. A control point was established at Thionville (VU 8688), and later moved to Mainz (WM 3657), to control traffic over the bridge at the latter place, and another was established at Muenchen-Gladbach (WF 0888) to control traffic over the Wesel bridge. The principal difficulty arose in the control of traffic over the Mainz bridge, mainly because of the Third Army's tendency to call forward selected freight rather than all requisitioned freight. The committee was able to correct this situation to a considerable extent, but in the meantime, the shortage of empty cars was acute, and was not corrected until after VE-Day. At one time the excess of loaded over empty cars reached 12,200 units. In order to obtain empty cars to reduce this shortage, it was found necessary to unload captured enemy material from cars returning from forward areas. No provision had been made for the storage at that point of this material, since the car hoarding had not been fully anticipated. It was, therefore, necessary to improvise unloading organizations, using Quartermaster base depot headquarters detachments, assisted by prisoners-of-war and civilians.

c. The capacity of the two Rhine River bridges had been estimated at 10,000 tons daily for each. As much as 13,590 tons were actually moved over the Mainz bridge and 16,720 tons over the Wesel bridge. The average movement over each bridge was 8000 tons daily, with the larger portion going over the Wesel structure.

SECTION 5

SPECIAL OPERATIONS

9

32. The "Toot Sweet Express." In order to expedite the movement of high priority freight from the Cherbourg (VO 1522) area, a railway operation similar to the Red Ball motor express was instituted. The plan contemplated a 20-car train leaving Cherbourg for Paris (VS 0544) daily; at Paris, additional cars were to be added and two trains of 20 cars each, one for movement to Farnur (VJ 9611) and the other to Verdun (VU 2766), were contemplated. Bids for space were to be submitted to Headquarters, Communica-

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tions Zone, in Paris (VS 0544), by 1600 hours for freight to be dispatched from Cherbourg (VO 1522) on the following day, and by 1000 hours for freight out of Paris. Special equipment was used and could not be reconsigned. The running time was fixed at 36 hours. Unloading was to be accomplished in six hours, and the train was to be ready to return in 12 hours. Truck capacity was to be used for trans-shipments in the Paris area. Service was planned to start during the week of 15 January 1945, but was postponed for lack of bids for space until 20 January 1945. During the first week of February, 1945, numerous trains were cancelled for the same reason. Shortly thereafter, however, the Armies' requirements increased. Weekly tonnage rose from 1,950 in the first week to 3,500 tons in the week of 13 March 1945, being full capacity. The northern destination was changed from Namur (VJ 9611) to Liege (VK 4727).

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33. Hospital Trains. Specially equipped hospital trains, adapted from British equipment, were assembled in the United Kingdom for early movement to the Continent. Prior to their arrival, ordinary French box-cars furnished with hospital equipment were used. By 1 October 1944, there were 14 hospital trains in use and 31 by the end of 1944. Almost 200,000 casualties were evacuated by 31 December 1944, in 633 trains. Hospital trains were under the command of the Chief Surgeon, and technical operation and stabling were the responsibilities of the Chief of Transportation. Movement schedules were established on the basis of requisition from the Theater Surgeon and forwarded to the Base or Intermediate Section in which the movement would originate. When French operators and train crews were required, requests were placed through liaison officers. These trains were dispatched over the entire distance to be traversed, without reference to changes in jurisdiction at various points in the route. The running time between Paris and Cherbourg, the principal port for the evacuation of casualties, was reduced from 18 to 12 hours. They were dispatched so as not to interfere with the movement of military cargo.

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34. Leave Trains. During the month of December, 1944, the first program for the accommodation of leave personnel, principally for movement to the Channel Ports for transportation to the United Kingdom, came into existence. Of principal concern to the Military Railway Service was the establishment of leave trains operating from forward areas to Paris. By February, 1945, this traffic had grown to substantial proportions. With the establishment of leave areas in the South of France, Brussels (VJ 6355), and Paris, a substantial portion of the passenger traffic of the railways consisted of personnel on leave and furlough. It was felt that the morale value of reasonably good accommodation warranted the use of the best available equipment. Three trains daily were operated between forward areas and Paris, accommodating an average of 1000 persons each. As the strength of the Armies increased on the Continent, permitting larger numbers of the personnel to be released for short periods of rest and recreation, the leave traffic increased and more trains were provided. Since it was not practicable to provide housing arrangements and sanitary facilities on the trains, it was necessary to establish stops en route. Some difficulty was experienced with leave trains consisting of relatively modern equipment, arriving from Germany. The re-routing of cars from such trains to French passenger service occurred in some instances. Representations were made to the French railway authorities and some improvement was noted. At no time, however, did such diversions jeopardize the continuance of the leave program, since in most cases, the cars were returned.

SECTION 6

MILITARY RAILWAY SUPPLY

1

35. Railway Supply in Southern France.

a. For railway operations in Southern France, responsibility for the procurement, storage, and issue of all railway construction material, normally the responsibility of the Corps of Engineers, was assigned to the Military Railway Service. In addition, the normal Transportation Corps supply activities pertaining to the procurement of locomotives, freight cars, and auxiliary equipment, as well as spare parts and other items common to railway supply and maintenance, were similarly the responsibility of the Military Railway Service.

b. The facilities of the Transportation Corps supply organization were used for the preparation of necessary documentation, and for control and expediting procedures. Depots, however, were operated by units that were organic to the Military Railway Service. Most Transportation Corps items were critical, and the receipt of locomotives, freight cars, and spare parts was slow. The existence of a reasonably good stock of equipment, some captured from the enemy but most of it of French ownership, enabled the earlier operation of railway facilities that might otherwise have been denied.

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36. Railway Supply in Northern France. All material and supplies used by the Military Railway Service were obtained through the Supply Officers of the railway units and the Supply Division of the Office, Chief of Transportation, Communications Zone. All railway material was stocked in Transportation Corps general depots, although several of these were used principally for railway supply. Track repair material was stocked in Engineer depots, and withdrawn by direct requisitions. Railway personnel were made available for the identification of railway material, which aided considerably in depot operations.

37. Supply Procedure Subsequent to Establishment of General Headquarters, Military Railway Service.¹

a. In February, 1945, the Military Railway Service was granted a form of limited exempt status under the command of the Director General, Military Railway Service. It was agreed at that time that the Transportation Corps would stock certain items of Engineer supply in their depots. This material, consisting principally of rails, ties, switch gear, frogs, cross-overs, and other track equipment, would provide for ordinary maintenance-of-way repair and replacement. It was considered that the availability of this material in the Transportation Corps depots would be advantageous in meeting emergency repair needs.

b. Experience had shown the desirability of maintaining such stocks for immediate availability, in order to incur the least possible delay in starting repair operations following wrecks, or bomb damage. It was general practice to store this material in convenient local dumps, rather than to rely on shipment from Engineer depots. This experience was general for both Military Railway Services, and it was fully appreciated in the reorganization of the Military Railway Service under limited exempt status. This material was usually stored on work trains to provide desired mobility. The frequent long delays in Northern France due to the inability to obtain such material readily from Engineer depots, often located at a considerable distance from the area in which the material was required, indicated that it was necessary to accumulate a reasonable quantity for immediate use. During February and March, 1945, an officer

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of General Headquarters, Military Railway Service, spent several weeks visiting Engineer depots all over Northern France, Belgium, and Western Germany trying to locate critical track material. Inexperience on the part of depot personnel in the identification of this material was the principal reason for delays in shipment.

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38. Shortages in Replacement Parts. Operations in both Northern and Southern France were hampered by shortages that developed in the supply of replacement parts for rolling stock, particularly for locomotives, both steam and diesel. Estimates of mortality rates for those parts for which a higher than average rate of wear might be expected were generally based on civilian practice, with good operation and periodic maintenance. Experience was limited in rates inherent in military operation, and this led to establishing replenishment factors on values that were later proved to be erroneous. There was a shortage of diesel engine parts due to the necessity for producing complete units to equip locomotives then under construction in the United States and which were scheduled for early delivery. This condition existed until the spring of 1945, at which time the flow of spare parts was increased. By that time sufficient experience had been accumulated to establish rates of expenditure based on military experience. During this period in which replacements were limited, extensive use was made of French manufacturing facilities and shop battalion equipment for the fabrication of parts.

39. Equipment Deficiencies.

a. Because of minor differences in construction, it was necessary to maintain separate stocks of spare parts for the steam locomotives of the 2-8-0 type of British and American manufacture.

b. Difficulties in the supply of coal for locomotives was responsible for the conversion of approximately 125 of the 2-8-0 type to oil burning. The type of fuel system devised for this purpose, using fuel common to other types of self-propelled military equipment, and requiring less attention and skill than in the use of coal, might have been used to greater advantage if provisions for such adaptation had been included in the original design.

c. Failure to provide electric headlights for both road and switching locomotives was responsible for a considerable number of accidents. This condition was especially troublesome during September and October, 1944, when there was no longer any necessity to operate under black-out conditions. At that time, there were a number of serious rear-end collisions due to over-running halted trains not protected by other visual signal devices.

d. A minor deficiency in the design of the arrangements for cooling the cylinder heads of the diesel engines, and lack of experience on the part of the operators with diesel equipment, were responsible for rendering a substantial proportion of the 65-ton diesel powered locomotives inoperative during the winter of 1944-1945. Because of the lack of the large number of replacement parts necessary to effect complete repair, this equipment was idle for a considerable period of time. Orders were placed for immediate shipment of the parts, and deliveries commenced soon after. Technical representatives of the manufacturers of the engines were of considerable help in the repair of this equipment, and in training the operators so as to avoid a recurrence of the trouble.

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o. The steam-operated brakes of the switching locomotives of the 0-6-0 type were responsible for a number of accidents in the yards. These brakes required different practices in operation from the standard air brakes of the road type locomotives, and it was necessary to familiarize the personnel with two different braking systems.

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CHAPTER 3

SUPPLY MOVEMENT AND ITS CONTROL IN RAILWAY OPERATIONS

40. Operations in Northern France.

a. During July and August, 1944, rail movement was hampered because of difficulties in arranging schedules for trains originating in the Normandy Peninsula. The first plan contemplated 20 trains per day, requiring the loading of from 600 to 800 cars. The car loading facilities were not concentrated in an area convenient to the supply dumps, and movement of freight was required by truck. Most of the dumps in the Normandy area were located in open fields, many of which had not been provided with truck-ways. This caused delays in train movement up to 24 hours by reason of trucks being mired.

b. With the capture of Paris (VS 0544) and the opening of a more extensive rail network east of that city, depots were established in its immediate vicinity. These depots were hastily organized and in some instances were moved on short notice to take advantage of better facilities available in other locations within the same area. Because of the speed with which they were opened for use, it was not possible to provide all of the necessary storage space and material handling facilities before the accumulation of inbound freight created severe congestion in the railway yards. This situation, however, was corrected before long.⁷

c. In early September, 1944, the first of the truck-to-rail transfer points was established. This was necessitated by the far greater rail capacity east of Paris than west of that city. It was necessary to move the greater portion of supplies by truck from the Normandy Peninsula to Paris until rail rehabilitation permitted through car movement. An installation was provided just outside of Paris. Freight was brought to this point by motor truck (the Red Ball operation), and there transferred to rail cars. The operation of installations of this type had not been provided for in the planning, and no Transportation Corps personnel had been assigned for the purpose. With Quartermaster support, however, the first transfer point was placed in operation promptly.^{5,8}

41. Problems in Movements Control in the Field.⁷

a. In August and September, 1944, some trains were badly over-loaded due to the tendency of Movements Division, Office, Chief of Transportation, to dictate train composition without knowledge of railway capabilities. The procedure was changed so that Movements Division could specify tonnage, classification, destination, and time of arrival desired, and the Military Railway Service made up the trains.

b. Oise Base Section reported a lack of co-ordination in the matter of movements information, as Normandy Base Section failed to pass on the information necessary to expedite forwarding. A lack of uniformity in reporting operational information contributed to the confusion.³ This was corrected to some extent by the issue of Circular 13, Office, Chief of Transportation, Communications Zone, European Theater of Operations, directing uniformity in forms and procedures.

c. During the late fall of 1944, a portion of the railroads

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in Northwestern France were placed under Phase III operations. Because of the necessity for moving United States cargoes in complete trains over French operated lines, in order to minimize the misdirection of critical material, a considerable amount of switching operations, and closely policed field control by Transportation Corps traffic personnel, were required.

d. Antwerp (VJ 6795) had been opened on 27 November 1944, and large tonnages were soon moving from there into the Liege (VK 4727) area. The facilities for rail movement at Liege (VK 4727) were deficient because of the destruction of bridges over the Meuse River. All trains had to pass over one bridge, which resulted in overcrowding and an accumulation of loaded cars. Construction of a second bridge was started, but it was not completed until late in January, 1945.⁶

e. In the Verdun (VU 2766) area, delays occurred in shipments into Ordnance and Quartermaster base depots. Limited track siding, together with a heavy volume of traffic, made it necessary to sidetrack cars in areas to the rear of Verdun (VU 2766), which resulted in congestion and delay in unloading cars. To remedy this situation two plans were prepared. One called for routing Ordnance supplies around Verdun (VU 2766), and the other provided for the establishment of a provisional traffic regulating station in Oise Intermediate Section, for the pre-classification of Quartermaster supplies. This station, located at Chalons-Sur-Marne (WT 5445), furnished information on all supplies destined for the Verdun (VU 2766)-Nancy (VU 8512)-Thionville (VU 8688) area before forwarding them. As a result of these changes, the difficulties were largely overcome.

f. Delays in unloading trains at forward depots, and their retention as "rolling" supply bases, caused equipment shortages difficult to overcome. This situation became critical in mid-November, 1944, and "selected" trains were side-tracked and their crews and locomotives were released for other assignment. At one time there was a train on the main track or on siding in every block from the Belgian frontier to Namur (VJ 9611). By the end of December, 1944, most of these deficiencies had been corrected.

42. Improvements in Supply Movements.⁶

a. The period between early January and mid-March, preceding closure to the Rhine River was characterized by effective rail supply movement. The first integrated supply movement program was in effect by this time. Documentation had improved considerably. Operating personnel were greatly benefitted by the relatively static operations which allowed them to accumulate experience and knowledge as to procedures.

b. The establishment of from one to three consignment points in the rear of each of the Armies simplified control. These points generally consisted of a railhead with adequate marshalling yards at a junction point between a main line and the branch lines leading to the railheads of the Army. Due to adequate communication, it was possible to provide timely information from these points to the regulating stations of Advance Section, Communications Zone, which in turn kept the Armies informed as to supply status. Frequent changes in location of these points on short notice, as the Armies advanced, required the maximum of co-ordination among the agencies concerned. Multiple address messages kept all agencies advised of changes of location. Later, Headquarters, Communications

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Zone, directed that such messages be addressed only to the Chief of Transportation, who was responsible for the further dissemination of them. The new procedure was not as satisfactory as the old. It caused delays by the introduction of an additional channel of communication.

43. Operations of the Combined Railway Systems.¹⁰

a. In the operations in Southern France, the relative simplicity of the control of supply movement was due to operation over a single line of communications. While it is true that several parallel railway lines were used, in effect the problem was one of classification and dispatch in one major area. This condition did not exist in Northern France, where a widely dispersed railway network was used, necessitating a higher degree of control. When the Armies were joined, however, the problems of distribution were common to both areas, and the more complex system of movements control was applied to both. The practices of both Military Railway Services were brought into conformity with the policies of the Communications Zone, and the Chief of Transportation became responsible for the control of movements in both operational areas, and the opening of railway traffic regulating station at Is-sur-Tille (WO 0984) in February, 1945, was the first step toward the assumption of his normal traffic regulating functions in Southern France. This was occasioned by the necessity for clearing a major back-log of cars then awaiting forward movement. The installation was fortunate in that extensive marshalling yards were available for use in the classification of cars and the make-up of commodity or standard trains.

b. In order to insure the successful execution of the over-all supply movement program, it was necessary to centralize the control of movements. This involved co-ordination and integration of all of the forms of transportation, starting with the direction of shipping to the ports for which the cargoes were intended and including all phases up to the distribution of those cargoes by truck operating beyond the most forward railheads. It was necessary to place responsibility for such co-ordination in one agency, rather than in a series of agencies, each of which was concerned with the operation of one form of transportation. There is a civilian precedent for centralized control in the common practice of the civilian railroad companies serving New York City, which operate bus lines to ferry terminals, ferry boats to rail terminals on the opposite bank of the Hudson River, and train service to the suburban communities in North Central New Jersey. The necessity for closely co-ordinated control exists to an even greater degree with military transportation, because of the requirement of flexibility, and because of the necessity for exercising economy in personnel.

44. Operations in Germany.¹⁰

a. It was noted throughout the course of operations, that reports from the field agencies of the Military Railway Service were not adequate for interpreting railway capabilities. With the advance of the Armies into Germany, reports as to loaded freight cars received and on hand in the Army areas became less and less accurate. As an index to the car situation in the Army areas, increasing reliance had to be placed upon reports of the Military Railway Service showing cars held back on the lines due to congestion. Throughout the month of March, 1945, there was an increase in the number of cars on hand in the Army areas. This resulted from the tendency of the Armies to order more than could be moved forward

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through railroad bottle-necks. In order to prevent a continuance of the upward trend of freight cars under load, a five-day embargo on movements to all the Armies in excess of a total of 10,000 tons per day was placed in effect, and was followed by a six-day embargo. The effect of these embargoes was negligible, due to the difficulty of disseminating information to the regulating stations in time for them to take effective action. With the opening of the Rhine River bridges, the return of empties was further delayed owing to the time lag in forwarding loaded freight cars to the new railheads. In spite of the constant pressure from the Office, Chief of Transportation, the situation was finally eased only by the end of the campaign in Germany.

b. Another source of trouble was the multiplicity of agencies concerned in supply movement control, particularly at the Mainz (WM 3657) and Wesel (RA 2241) bridges over the Rhine River. The First and Third Armies were using the bridge at Mainz (WM 3657) and the two Army regulating stations, the G-4 Section of Advance Section, the district Rail Transportation Officer, and frequently Army representatives all exercised some sort of movement control. In addition, two railway operating battalions were concerned in moving the trains, introducing additional elements of confusion. This difficulty was solved by the formation of a regulating committee, consisting of representatives of all of the interested agencies, which controlled the flow of traffic to the bridge.⁶

45. Documentation.¹⁰

a. Documentation of rail traffic in the United Kingdom was copied from British military practice. Prior to the arrival of the United States Forces, the British railway organizations were experienced in the handling of military traffic, and the British Movement Control organization had achieved standardization of the forms of documentation. United States traffic moved under similar arrangements, with the exception that distinctive car labels were added. In general, due to the efficiency of the British transportation system and its movements control procedures, together with the absence of language difficulties, documentation of freight traffic did not present a problem.

b. The planning for rail documentation on the Continent was of a general nature. Following the lead of the British Forces, some consideration was given to the use of freight warrants, but it was finally decided to use United States forms for documentation. Although the British experience in 1939 and 1940 had proved the value of bi-lingual or tri-lingual forms, none existed for American use during the early stages of the campaign on the continent. In Phase I and II operations, this deficiency had no serious effects, but when Phase III operations were inaugurated, it became a source of considerable difficulty. Although immediate steps were taken to remedy it, printing difficulties caused a further delay during a time when the efficient use of transportation was critical.

c. Although contacts were made late in September, 1944, with the French railway authorities with the idea of instituting a uniform system of rail documentation, the negotiations were prolonged and it was not until 1 January 1945, that instructions finally reached the Rail Transportation Officer in the field as to the forms of documentation provided in the agreement. Because of this delay, it was not possible to verify accurately the figures for tonnage moved prior to 1 January 1945. The British, profiting by their experience earlier in the war, maintained accurate records

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of all tonnage moved by civilian carriers, and thus possessed all the figures necessary to effect an accurate settlement.

46. Adherence to Civilian Practice. Advance Section, Communications Zone, in its comments on railway operations, indicated that the Military Railway Service endeavored to maintain orthodox railway practice in a situation where the Military needs dictated otherwise.⁶ Civilian railroad traffic departments prepare freight capacity requirements based on firm commitments--more often than not long term contracts, perhaps reasonable, but anticipated. Demurrage charges discourage car hoarding, and receiving depots are usually adequate for the prompt reception of cars, their unloading and return. These circumstances seldom exist in military railway operation, where frequently changing requirements necessitate other than the maintenance of fixed schedules and prompt return of cars. The agency responsible for planning movements must have field contacts that provide the necessary information as to car location and status, in order to co-ordinate all railway transportation functions and to insure the uninterrupted flow of material to the consumer on the battle line. Experience in the European Theater of Operations indicated that this information could best be furnished by the representatives of the agency responsible for planning the movements, namely, the local Railway Transportation Officers. This comment applies with equal force to the operations of the Military Railway Services in both Northern and Southern France during the early stage of the campaign, and later to the over-all railway operations.

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CHAPTER 4

SUPPORT OF MILITARY RAILWAY OPERATIONS BY OTHER SERVICES

SECTION 1

ENGINEER SUPPORT

47. Early Operations in Northern France.⁶

a. The shortage of railroad construction tools and the inadequate training of railroad construction units were known by, and was a matter of deep concern to, the Engineers prior to the opening of operations. The delay in moving Service troops into the lodgement area in operation "Neptune," was further complicated by the failure of tools and equipment to arrive. Track material arrived lacking critical parts and therefore useless. Some railroad tools and track material were, however, found locally and damage to the existing plant was much less than had been anticipated.

b. The lack of damage to the main line between Lison (VT 5378) and Cherbourg (VO 1522) permitted more time for the repair of rail facilities in Cherbourg itself, which was badly damaged. Only four of the main line bridges, totalling 411 lineal feet, required reconstruction. Damage to the marshalling yards at Carentan (VT 3984) and Lison was severe, and development of supplementary yard facilities was necessary at Couville (VO 0914), in addition to the planned yards at the Terre Plein. Provision for the reception of freight cars and locomotives at Cherbourg was extremely urgent.

c. In the reconstruction of yard and main line track, the inexperience of the troops assigned to that task became evident. Railway tracks were laid on the ground without ballasting in some cases, particularly in the Le Molay (VT 6677) yard. During the rainy fall weather, the ground settled, leaving the tracks improperly supported. In these yards, there were 21 derailments within an eight-hour period. Some of this trouble was due to failure to complete drainage arrangements, and because of improperly filled bomb and shell craters.⁷ Allied air bombing had been concentrated on marshalling yards and major terminal facilities. In all cases, when military railway units took over new sections of railways, major reconstruction was found to be necessary in the yards.

d. By 31 July 1944, reconstruction of 126 miles of track and four bridges had been accomplished and rail reconstruction in Cherbourg was virtually complete with the exception of a portion of the marshalling yards. The rail situation with the exception of supply was satisfactory, considering tactical progress. The offensive at St. Lo (VT 4963), however, imposed additional problems. The supply situation still required requisitioning from local sources. Further difficulties in sorting material and equipment on hand by untrained depot personnel, contributed to this condition.

48. Railway Reconstruction Units Formed.⁶ During August, 1944, the plan for assigning Engineer units to operate in the rear of each Army became effective. Because of the rapid advance, Advance Section, Communications Zone, concerned over the uncertain performance of the Engineer units, which were assigned to areas with general responsibility for construction, organized three Engineer groups, designated as A, B, and C, with the specific mission of railroad rehabilitation. Each group consisted of an experienced Engineer general service regiment and one or more additional units attached for operations.

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One group was assigned to the rear area of each of the First and Third Armies, and the third was deployed in the rear of the other two. When the Fifth Army became operational, the third group was designated for its support and other units took over the responsibilities in the rear. This plan was highly effective. The value of the Engineer support of railway activities is indicated by the fact that, in the 50 days following the break-through at St. Lo (VT 4963) 3,355 miles of track were restored to operating conditions and 36 bridges totalling 4,700 lineal feet were rebuilt.

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49. Operations in Support of the Bridging of the Rhine River.

a. The plans for Engineer assistance in the assault upon Germany, prepared in the last two months of 1944, called for the provision of a double track line, and a single track bridge over the Rhine River, in each of the three Army zones. The Fifth Army was to be served by the line Aachen (VK 8443)-Muenchen-Gladbach (WF 0888)-Geldern (RA 0126)-Wesel (RA 2241)-Muenster (RA 9374), with a bridge at Wesel (RA 2241). The First Army was to be served by the line Aachen-Duren (WF 1436)-Cologne (WF 4650), with a bridge at Cologne. The Third Army was to be served by the line Thionville (VU 8688)-Trier (WL 2129)-Coblenz (WL 8995), with a bridge at Coblenz. It was contemplated that at first truck delivery would provide supplies east of the Rhine River.

b. Reconstruction of the demolished railroad bridges over the Roer River was begun by Group A at a point near Baal (VK 9872), and by Group C at a point near Duren. Both of these bridges were open by 11 March 1945. The 1056 Port Reconstruction and Repair Group, which had completed the 634-foot bridge over the Meuse River at Maastricht (VK 5553), was assigned the mission of opening the line from Baal via Muenchen-Gladbach and Krefeld (RA 1604) to Geldern, and preparing for the extension of this line to the bridge site at Wesel. Group C began construction of the lines east from Duren toward Cologne, and southeast from Duren-Euskirchen (WF 3329)-Bonn (WF 5537). Group B was given the mission of opening a line from Thionville to the Bingen (WI 1142)-Mainz (WF 3657) area. Reconnaissance indicated that the line Thionville-Falk (WQ 2071)-Saarbruecken (WQ 4551)-Homburg (WQ 7170)-Bingen could be opened by the reconstruction of two bridges, one over the Saar River at Saarbruecken, and the other over the Nahe River at Bad Muenster (WI 0838). Except for a small section of track between Falk and Saarbruecken, there was no extensive damage. Work was begun without delay and this line was opened 1 March 1945. Material was assembled at once for bridging the Rhine River at Mainz.

c. Because of excellent planning and careful phasing of material flow, the construction of bridges over the Rhine River proceeded on schedule. These operations were as follows:

(1) Working 24-hours daily, the Engineers completed the bridge at Wesel on 8 April 1945 in 10 days, four hours, and 45 minutes. The structure was a 23 span, girder type, trestle bridge 1,735 foot long. All spans were 75 foot long, except one 92-foot span for navigation. Almost 14,000 feet of track and six turn-outs were constructed.

(2) The Mainz bridge required the spanning of 3,444 foot, including approximately 1,400 feet of the old bridge which could be used. The bridge was constructed of "Motor beams" on trestles which were supported on piles. This bridge was completed for traffic on 14 April 1945, in 10 days and 34 minutes. From Mainz the lines were opened to Kassel (RO 2003), Leipzig (AE 2314), Munich (WF 8456), and Nurnburg (WO 4200).

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(3) At Duisburg (RA 3314), construction of another bridge was begun to supplement the Wesel bridge, then contemplated for joint United States/British use. The bridge at Duisburg was of the girder type, with light steel trestles supported on wood piers, except in the deeper portion of the river where steel piles were used. Concrete bases were used on the west side. This 2,815 foot bridge was completed on 8 May 1945, in six days, 14 hours, and 20 minutes. This operation was an outstanding engineering accomplishment in support of railway activities.

(4) Two additional bridges were constructed over the Rhine River at Mannheim (WH 5300) and Karlsruhe (WR 4746) for the support of the 6 Army Group. The Ernie Pyle railway bridge at Mannheim, of wood trestle construction, was completed on 25 April 1945. Construction had been started shortly after the initial crossing on 1 April 1945. The construction of both these bridges, unlike the others over the Rhine River, was under the direction of the Military Railway Service. The railway bridge at Karlsruhe was completed on 15 May 1945.

d. These construction records show definitely the advantage of making railway construction the responsibility solely of the Corps of Engineers.

50. Joint Reconnaissance Responsibilities. The lack of an organized program for joint reconnaissance by the Engineers and the Military Railway Service, prior to the reconstruction of certain routes, resulted in confusion and delay. In many instances, routes were designated arbitrarily, without consideration of operating requirements. In other instances, no attention was paid to ruling grades on parallel or nearly parallel lines, resulting in operating difficulties. It was later found to be possible to have used parallel routes, where more suitable track conditions existed. There was an example of this situation in the abandoning of the rail line from Libramont (VP 3148) to St. Vith (VP 8588), which had been selected without consulting Military Railway Service as to its suitability for main line operations. After it had been repaired it was found to present so many operating difficulties that its use was discontinued after an adjacent, though somewhat longer, route was provided.

SECTION 2

SIGNAL CORPS SUPPORT

51. Operations in Northern France.⁷

a. The signal communications plan for military railways called for five principal circuits to be provided as follows:

- (1) Dispatcher's circuit for train movement control between points.
- (2) Message circuit for general communications.
- (3) Movement control circuit from Headquarters, Military Railway Service, to all Grand Divisions.
- (4) Local movement control circuit between Grand Divisions and Railway Operating Battalions.
- (5) Teletype service between principal points.

b. Shortages in signal equipment and time required that only the minimum facilities be provided. According to plan the dispatcher's and message circuits were given priority for repair and new installations, when required. In addition to this, provision was made for 10 long range mobile radio sets for command control purposes. The necessity for using

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"off the main line" trackage, in order to bypass heavily damaged installations, made the communications problem a major one.

c. The usual practice was to string a single "pair" along the railroad right-of-way, using whatever support was available or placing the wire on the ground. Accidental cutting, or deliberate cutting by German stragglers, caused many train delays. It was not uncommon to see three or four trains backed up at one station, awaiting train orders. The use of motor couriers helped to some extent but was not a good method of dispatching trains. The inadequacy of signal communications was especially serious in single track operations. At one time, the frequency of accidents, caused by poor signal communications as well as by the lack of a conventional visual system and of headlights on the locomotives, made it necessary to stop counter-movement on single track lines,⁵ thus increasing the "turn-around" time of cars and locomotives. This instance occurred just before the Falaise (VU 1436) pocket was cleared, and the return traffic scheduled to follow a northern route from Dreux (VR 3135) to Le Mans (VV 4161) was denied by enemy activity. A large back-log of loaded cars accumulated at Le Mans.⁶

d. Most of the communication problems were due to the rapid advance of the Armies. Because of this, there was not sufficient time for the immediate installation of all of the signal facilities required. However, the fact remains that in many cases the only dispatcher's circuits that were ever installed were provided by the signal platoons of the railway operating battalions, with the assistance of civilian technicians. This situation could have been improved through better planning and cooperation of the part of the Signal Corps officers responsible for those functions.

52. Operations in Southern France.² From the beginning, Signal Corps support was timely and effective. The relatively narrow area required for railway operations, and the more favorable climatic conditions south of Dijon (WO 0461), aided in the early provision of signal communications facilities. The rapidity of advance necessitated immediate reliance on radio equipment. A wide spread radio network was provided for the control of the military railways. It was of material assistance in minimizing the problems of rail traffic control. Nine stations were in operation in important railway control centers. Teletype service between forward and rear headquarters was also established before the end of January 1945.

53. Final Phase of Operations. In the period during which the Armies advanced to the Rhine River and subsequent to the crossing of it, signal communications improved immeasurably.⁶ In this instance equipment and personnel were available and signal reconstruction teams kept abreast of railway repair. Had it been possible to effect this form of cooperation earlier in the campaign, much time and effort would have been saved, and much of the congestion that occurred in the earlier phases could have been avoided.

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CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

54. Conclusions. The operations of the Military Railway Service in the European Theater of Operations were characterized by the following:

a. It operated most efficiently as a centrally controlled organization, as an integral element of the transportation system.

b. Its organization developed minor deficiencies because of the lack of sufficient numbers of:

- (1) Experienced operating personnel.
- (2) Commissioned officers with adequate military background, suitable for the exercise of command functions.
- (3) Trained cadre personnel for supply and administration.
- (4) Officers suitable for assignment to liaison duties.
- (5) Personnel for the operation of stations and yards.

c. Its organization did not include provision for a headquarters for the control of more than one Military Railway Service.

d. Lack of security personnel organic to the Military Railway Service required the use of Military Police units for protection of freight in transit.

e. When the tactical situation permitted, its operations in conjunction with civilian railway organizations of liberated Allied countries, the railway facilities of which were partially, and later wholly, under civilian management were satisfactory.

f. The retention of responsibility for maintenance of rail-road right of way, with authority for the storage and issue of sufficient track material for that purpose, was justified.

g. Equipment was adequate and in sufficient quantity. Deficiencies in operation occurred because of:

- (1) Lack of complete standardization of type 2-8-0 locomotives which required maintenance of separate stocks of replacement parts.
- (2) Failure to provide headlights on locomotives.
- (3) Unsatisfactory brake operating equipment on type 0-6-0 switching locomotives.
- (4) Shortage of replacement parts for locomotives.

h. The exercise of the functions of movement control were most efficiently performed when under the supervision of the Chief of Transportation, through the Movements Division of his office.

i. The retention of responsibility for railway construction

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and reconstruction by the Corps of Engineers was justified.

j. Signal Corps support was most effective when provided during the course of reconstruction of the rail lines, so that signal communications were available when the lines were ready for operation.

55. Recommendations. It is recommended that:

a. The operation of military railways remain a function of the Transportation Corps.

b. A Military Railway Service be established under the command of the Chief of Transportation, with necessary command functions delegated to a Director General, Military Railway Service, Transportation Corps.

c. An appropriate Table of Organization and Equipment be provided for a Headquarters and Headquarters Company, General Headquarters, Military Railway Service, when the use of more than one Military Railway Service in a Theater of Operations is contemplated.

d. A permanent civilian reserve component of the Military Railway Service, comprised of both commissioned officers and enlisted men and recruited from civilian railroad personnel, be established and maintained. Further, that the training program for this component include as much as possible of field training, both tactical and military.

e. The study of military railway transportation be included in the programs of the special staff and service schools, in both its technical and logistical aspects.

f. That a cellular type of Table of Organization and Equipment be provided for the Railway Operating Battalion, and that its organization include augmentation teams for station and yard operation.

g. The Military Railway Service be responsible for protecting freight in transit and that sufficient personnel for that purpose be provided within the organization of the operating battalions.

h. The policy of operating railways for the transportation of military personnel and supplies, incorporating civilian operation and management, where friendly personnel is available, and when the tactical situation permits, be continued as operational doctrine.

i. The storage and issue of limited quantities of track repair material for use in normal maintenance of way operations be authorized.

j. Procurement policies for railway equipment incorporate the maximum degree of standardization.

k. Complete units of railway equipment when shipped to a Theater of Operations be accompanied by an adequate supply of replacement parts.

l. Responsibility for the control of supply and personnel movement remain with the appropriate staff section of the Office, Chief of Transportation.

m. Responsibility for railroad construction and reconstruction remain with the Corps of Engineers.

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n. Provision be made for joint Signal Corps-Corps of Engineers support in railway reconstruction to permit the earliest possible establishment of railway operations.

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NOTE:

Where no reference is indicated by an exponentially placed Arabic numeral, the statement is based upon the experience or personal knowledge of the members of the Transportation Section, The General Board, or of the principal consultants.